IAD047303771
0014

Page 48 redacted per exemption 6 - PII

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99
Revised 9/20/02

RCRA Corrective Action
Environmental Indicator (EI) RCRA Info code (CA725)
Current Human Exposures Under Control

Facility Name: Collis Inc.
Facility Address: 2005 S. 19th Street, Clinton, IA 52732
Facility EPA ID #: IAD047303771

DETERMINATION RESULT: YE

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__X__ If yes - check here and continue with #2 below.

_____ If no - re-evaluate existing data, or

_____ if data are not available skip to #6 and enter"IN" (more information needed) status code.

The Collis, Inc. (Collis) facility is located on about 12.5 acres in Clinton, Iowa (see Figure 1). The facility has gone through a number of ownership changes since it was opened by Collis in 1915, but it is now a division of SSW Enterprises, Inc., which acquired Collis in 1998 (Heritage Environmental Services [Heritage] 2000a). Collis began in 1915 by manufacturing wire products, prefabricated buildings, and other metal agricultural parts. In 1964, the facility switched to manufacture of refrigerator parts, including wire racks, shelves, and other accessories (Heritage 2000a; U.S. Environmental Protection Agency [EPA] 2001). In the past, Collis's manufacturing processes included zinc-cyanide and nickel-chromium plating, but it has converted all its current operations to zinc-chloride plating and epoxy-powder coating (Heritage 2000a). Collis has also operated a wastewater treatment plant (WWTP) since 1970. From 1970 until 1979, sludges from the wastewater treatment plant were directed to surface impoundments. After 1979, sludges were landfilled offsite (Heritage 2000a). The facility continues to discharge wastewater to Manufacturers Ditch under a National Pollutant Discharge Elimination System (NPDES) permit (Heritage 2000a). The facility now generates less than 100 kilograms of hazardous waste per month (EPA 2001).

The Collis facility has been monitored and investigated since at least 1986, when the facility closed the surface impoundments. The closure process continued from 1986 to 1993, when the facility entered into an Administrative Order on Consent (AOC) with EPA. The AOC required the facility to conduct a Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) to determine the nature and extent of releases from seven solid-waste management units (SWMU) at the facility (Heritage 2000a) (see Figure 2). Investigations of groundwater, soil, sediment, and surface water contamination continued through the 1990s, with the RFI completed in 1998 (Heritage 1998a). Additional investigations were conducted in 2000 (Heritage 2000b).

The primary contaminants released to soil, groundwater, sediment, and surface water from Collis's SWMUs are metals derived from the plating process (especially chromium, nickel, and zinc); chlorinated and petroleum-derived volatile organic compounds (VOC); and polycyclic aromatic hydrocarbon (PAH) semivolatile organic compounds (SVOC) (Heritage 2000a). Polychlorinated biphenyls (PCB) also have been detected in a limited number of locations at the facility (Heritage 1998a).

SWMU 1 - Floor Drain, Sump, and Overhead Pipe System (FDS). SWMU 1 includes the plating lines and other equipment used to channel waste to the WWTP, including spent caustics, rinse water, spent pickle solutions, and spent metal solutions (Heritage 1994). It was built in 1970, and the lines are still in use, although the wastes are no longer hazardous (Heritage 1994). Metals have been detected in subsurface soil and groundwater from the area of this SWMU (Heritage 2000a).

SWMU 2 - Pollution Control Building (PCA). SWMU 2 is the location of the process wastewater system and WWTP, consisting of several concrete underground storage tanks (UST) and two aboveground storage tanks for the batch treatment of chromate solutions, spent acid, and caustic soda solution (Heritage 1994). It was constructed in 1970 and is still in use. Metals have been detected in surface and subsurface soils, and VOCs have been detected in surface soils and groundwater at this SWMU (Heritage 1998a, 2000a).

SWMU 3 - Sludge Management Area (SMA). SWMU 3 includes the solids settling tank and sludge filter press operations that are used to process and dewater sludge from the WWTP (Heritage 1994). The WWTP was constructed in 1970 and is still used today, although sludges are now disposed of offsite (Heritage 1994). The settling basin occasionally has overflowed, and inspections of the WWTP by Iowa Department of Environmental Quality have documented several instances of poorly stored chemicals in SWMU 3 (Heritage 1994). Metals have been detected in surface soils, and VOCs have been detected in subsurface soils and groundwater at this SWMU (Heritage 2000a).

SWMU 4 - Sludge Impoundment Area (SIA). SWMU 4 includes the area of the former sludge impoundments, which were built in 1970 as part of the WWTP and received sludge until 1979 (Heritage 1994). Sludges are now sent to an offsite landfill (Heritage 1994). The SIA impoundments were excavated to a depth of about 3 to 4 feet below grade but were not lined (Heritage 1994). In some cases, the bottom of the impoundment was at the water table (Heritage 1994). Although the number of impoundments varied, with as many as seven impoundments for hazardous waste (sludges) before 1980, there were five impoundments in 1980 when the facility began the closure process (Heritage 1994). The facility conducted closure activities (excavation and investigation) from 1986 to 1990, but the facility never received a clean-closure certification (Heritage 2000a). The area is now grass covered, and the impoundments were filled with a variety of materials, including organic matter, clay, cinders, bricks, glass fragments, metal shavings, and gravel (Heritage 1998a). Metals have been detected in surface and subsurface soils. PCBs, VOCs, and SVOCs have been detected in surface soil (Heritage 2000a). VOCs have also been detected in groundwater (Heritage 1998a).

SWMU 5 - Closure Pretreatment Area (CPA). SWMU 5 was used only from 1986 to 1987 as an area to treat water generated during the closure of the sludge impoundments (Heritage 1994). It consisted of three 27-foot diameter swimming pool tanks and was dismantled in 1988 (Heritage 1994). Metals have been detected in surface soil, and VOCs have been detected in groundwater from the area of this SWMU (Heritage 2000a).

SWMU 6 - Northeast Yard and Receiving Dock, Outdoor Storage Yard (NEY). SWMU 6 is an area used for receiving, storing, and shipping products and waste (Heritage 2000a). It was also the location of a railroad spur (no longer in service) and a gasoline UST that was removed in 1988 (Heritage 1994, 1998b). The area currently is used to store empty drums, scrap metal, and waste oil (Heritage 1994). Metals, VOCs, SVOCs, and PCBs have been detected in surface and subsurface soil. VOCs have been detected in groundwater from the area of this SWMU (Heritage 1998a).

SWMU 7 - Manufacturers Ditch Area (MDA). SWMU 7 is the main stormwater drainage ditch for Collis and other industrial, residential, and agricultural stormwater runoff from upstream and downstream of the facility (Heritage 1998a). In 1992, the ditch was dredged and excavated by the city, and the materials were used as fill material at a nearby park (Heritage 1994). Metals and VOCs were detected in soil and sediment, and VOCs were detected in groundwater from this SWMU (Heritage 2000a). Surface water was not significantly contaminated.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRA Info national database ONLY as long as they remain true (i.e., RCRA Info status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act] from releases subject to RCRA Corrective Action (from SWMUs, RUs, or AOCs)?

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			
Air (indoors)[2]	X			
Surface Soil (e.g., <2 ft)	X			
Surface Water		X		**See below for details**
Sediment	X			
Subsurf. Soil (e.g., >2 ft)	X			
Air (outdoors)		X		

_____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

The Collis facility is located on about 12.5 acres in Clinton, Iowa, in an area that has been designated an industrial development zone by the city of Clinton (see Figure 1) (Heritage 2000a). The surrounding land is used for a mix of residential, agricultural, commercial, and light industrial activities (Heritage 2000a). The facility is bordered on the

---

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2]Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

north by railroad tracks, on the north and west by Manufacturers Ditch, on the west by S. 19thStreet, on the south by residential neighborhoods, and on the east by a golf course. There is a wooded buffer separating residential areas and the golf course from the facility (Heritage 2000a). The facility itself is covered by a mix of buildings, asphalt, gravel, and vegetation, with very little exposed soil (Heritage 2000a).

The Collis facility sits in the alluvial flood plain of the Mississippi River, and the nearest surface water body is Manufacturers Ditch, which is perennial but with very low flow (Heritage 1994). The ditch receives stormwater runoff from the facility and from mixed-use areas upstream and downstream; it also receives treated wastewater from the facility's NPDES-permitted outfall (Heritage 1998a). Stormwater runoff at the facility also drains into ditches along S. 19th Street and into storm sewers (Heritage 1994).

The surficial geology and hydrogeology of the site is dominated by alluvial materials and weathered bedrock. Unconsolidated materials at the facility consist of layers of clayey silts and silty clays overlying layers of sand and gravel (Heritage 1994). The depth to bedrock ranges from 6 to 118 feet, and the facility is underlain by two bedrock valleys that meet under the facility (Heritage 1994). The uppermost bedrock is Silurian limestone that has been weathered at its surface (Heritage 1994). The Silurian bedrock is underlain by a thick sequence of Ordovician confining beds, then by Cambrian and Ordovician sandstone and limestone aquifers (Heritage 1998a). Monitoring wells at the facility are completed in the unconsolidated material and weathered Silurian bedrock, and the water table in these wells is about 2.5 to 14.3 feet below ground surface (bgs) (Heritage 1994). Groundwater in the unconsolidated material and weathered bedrock flows from south to north and west, toward the ditch (Heritage 2000a). Because of relatively low yields from the surficial materials, the facility production well is completed in Cambrian sandstone, about 1,633 feet bgs (Heritage 1994). Similarly, a drinking water well operated by the municipal water supply (about 0.5 mile from the facility) is 2,020 feet deep (Heritage 1994).

Groundwater

Groundwater samples at the Collis facility have been collected from 1995 to 2000 as part of the RFI (Heritage 2000a, 2000d). At the time of the RFI, the facility had installed 12 monitoring wells and abandoned 8 of them (Heritage 1998a). To complete the RFI, the facility installed an additional 10 wells, 4 of which were completed in bedrock (Heritage 1998a, 2000b). The facility also maintained two piezometers in which it measured water levels and from which it sometimes collected groundwater samples (Heritage 1998a). The locations of monitoring wells are shown on Figure 2. Groundwater samples collected for the RFI and as part of the corrective measures study (in 2000) were analyzed for VOCs, SVOCs, cyanide, and total and dissolved metals (Heritage 1998a). In general, unfiltered samples will have higher concentrations of metals because of the contribution of metal from suspended sediment.

The most contaminated groundwater samples were collected from the wells on the northern, downgradient edge of the facility. Table 1 shows the maximum concentrations of metals, cyanide, and VOCs. None of the groundwater samples collected had detectable concentrations of SVOCs (Heritage 1998a). None of the dissolved metal concentrations exceeded their relevant EPA maximum contaminant level (MCL) or preliminary remediation goal (PRG). Unfiltered samples from well MW-22 had very high concentrations of metals, but this well had excessive suspended solids and was subsequently abandoned (Heritage 2000a). Similarly, the only sample that exceeded the MCL for cyanide was collected from MW-22 (Heritage 1998a). Chlorinated VOCs are the primary constituents of concern in groundwater from the facility. The compounds 1,1-dichloroethene (DCE), 1,2-DCE, trichloroethene (TCE), and vinyl chloride (VC) are all present in concentrations that exceed their relevant MCLs (maximum concentrations of 8 micrograms per liter [µg/l], 1,200 µg/l, 600 µg/l, and 500 µg/l, respectively) (Heritage 1998a, 2000b, 2000c, 2000d).

Table 1 – Maximum Concentrations of Constituents in Groundwater

Constituent	Concentration (µg/l)	Well	Date	EPA MCL (µg/l)	Other Wells Exceeding MCL
Dissolved Metals					
Chromium	40	MW-2	August 1995	100	None
Nickel	340	MW-39	May 1996	730*	None
Zinc	680	MW-39	May 1996	11,000*	None
Total Metals					
Arsenic	99	MW-37	September 2000	NA	NA
Cadmium	11	MW-22	July 1997	NA	NA
Chromium	2,600	MW-22	July 1997	NA	NA
Lead	17	MW-22	September 2000	NA	NA
Nickel	810	MW-22	July 1997	NA	NA
Zinc	5,500	MW-22	July 1997	NA	NA
Dissolved Cyanide					
Cyanide	**260**	MW-22	August 1995	200	None
Total Cyanide					
Cyanide	260	MW-22	August 1995	NA	NA
Volatile Organic Compounds					
Acetone	32	MW-2	July 1997	610	None
1,1-Dichloroethene	**8**	MW-39	May 1996	7	
1,2-Dichloroethene (total)	**1,200**	MW-2	July 1997	70**	MW-34, MW-35, MW-36, MW-37, MW-38, MW-39
cis-1,2-Dichloroethene	**1,100**	MW-39	May 1996	70	MW-2, MW-34, MW-35, MW-36, MW-37, MW-39, MW-42
trans-1,2-Dichloroethene	56	MW-39	May 1996	100	None
Toluene	5	MW-38	May 1996	1,000	None
Trichloroethene	**600**	MW-42	September 2000	5	MW-2, MW-13, MW-34, MW-35, MW-36, PZ-41
Vinyl chloride	**500**	MW-38	July 1997	2	MW-2, MW-34, MW-35, MW-36, MW-37, MW-39, MW-42, PZ-40

Notes:

Concentrations in bold exceed the MCL (EPA 2002a). Table derived from the 1998 facility investigation and 2000 supplemental investigation (Heritage Environmental Services 1998a, 2000b, 2000c, 2000d).

* EPA does not specify a MCL for this constituent (EPA 2002a). EPA Region 9 preliminary remediation goal used (EPA 2002b).

** Because *cis*-1,2-dichloroethene (DCE) makes up as much as 90 percent of the total 1,2-DCE concentration, the MCL for *cis*-1,2-DCE has been used here.

EPA = U.S. Environmental Protection Agency

MCL = Maximum contaminant level

NA = Not applicable. MCLs are established for dissolved concentrations.

µg/l = Micrograms per liter

Surface and Subsurface Soil

Surface and subsurface soils at the Collis facility are contaminated with metals, VOCs, SVOCs, and PCBs. Surface (collected from a depth of less than 2 feet) and subsurface (collected from a depth of more than 2 feet) soil samples were collected at Collis during site investigations associated with RCRA closure activities and in support of the RFI (Heritage 1998a). Samples were analyzed for metals, cyanide, VOCs, SVOCs, and PCBs. RFI soil sampling locations are shown in Figure 3. In general, metals were detected in the soils throughout the site, VOCs were detected primarily in the northwestern corner of the site, and SVOCs were detected primarily in the northeast corner of the site (Heritage 2000a).

Surface soil at the facility is contaminated with metals, VOCs, SVOCs, and PCBs. Table 2 shows the maximum concentrations of a range of constituents found in surface soil. The highest levels of contamination in surface soil are from SWMU 6, the northeast yard, receiving dock, and outdoor storage area. The only metal that exceeds industrial or residential PRGs is chromium. The maximum concentration of chromium was 6,700 milligrams per kilogram (mg/kg), which exceeds the industrial PRG. Five VOCs – ethylbenzene (maximum concentration of 21 mg/kg), tetrachloroethene (PCE) (6 mg/kg), tetrahydrofuran (140 mg/kg), toluene (820 mg/kg), and TCE (200 mg/kg) – exceeded industrial PRGs, and one, 1,2-DCE (52 mg/kg), exceeded residential PRGs. Seven SVOCs, primarily PAHs, exceeded industrial PRGs – benzo(a)anthracene (maximum of 550 mg/kg), benzo(a)pyrene (540 mg/kg), benzo(k)fluoranthene (estimated 310 mg/kg), chrysene (970 mg/kg), bis(2-ethylhexyl)phthalate (estimated 240 mg/kg), indeno(1,2,3-c,d)pyrene (570 mg/kg), and naphthalene (estimated 210 mg/kg). Finally, two PCBs were detected at the facility – one, Aroclor 1254, at concentrations above residential PRGs, and the other, Aroclor 1260, at concentrations above industrial PRGs. The maximum concentrations were 0.57 mg/kg and 8.5 mg/kg respectively.

Subsurface soil at the facility is contaminated with metals, VOCs, SVOCs, and PCBs. Table 3 shows the maximum concentrations of a range of constituents found in subsurface soil. The highest levels of contamination in subsurface soil are from SWMU 4, the former sludge impoundment area. Three metals exceed industrial PRGs – arsenic (maximum concentration of 47 mg/kg), chromium (13,000 mg/kg), and lead (1,000 mg/kg). Seven VOCs – benzene (maximum concentration of 18 mg/kg), 1,2-dichloropropane (6 mg/kg), ethylbenzene (75 mg/kg), tetrahydrofuran (45 mg/kg), toluene (110 mg/kg), TCE (60 mg/kg), VC (120 mg/kg), and xylene (96 mg/kg) – exceeded industrial PRGs, and one, 1,2-DCE (96 mg/kg), exceeded residential PRGs. Nineteen SVOCs, primarily PAHs, exceeded industrial PRGs (see Table 3 for a list of constituents and concentrations). Finally, two PCBs were detected at the facility at concentrations above their industrial PRGs – Aroclor 1254 (maximum concentration of 1.5 mg/kg) and Aroclor 1260 (7.5 mg/kg).

Table 2 – Constituents Detected in Surface Soil

Constituent	Concentration (mg/kg)	SWMU	Depth (ft bgs)	EPA Region 9 Residential PRG (mg/kg)	EPA Region 9 Industrial PRG (mg/kg)
Metals					
Cadmium	10.0	2	1 - 8	37	450
Chromium	**6,700.0**	1	0.5 - 1.5	210	450
Nickel	240.0	1	0.5 - 1.5	16,000	20,000
Zinc	5,800.0	1	0.5 - 1.5	230,000	100,000
Cyanide					
Cyanide	590	4	0 - 2	1,200	12,000
Volatile Organic Compounds					
Acetone	480 J	6	0 - 2	1,600	6,000
Carbon disulfide	9	6	0 - 2.5	360	720
1,2-Dichloroethene (total)	*52*	2	0 - 4	43*	150*
Ethylbenzene	**21**	6	0 - 2.5	8.9	20
Methyl ethyl ketone	61 J	6	0 - 2	7,300	27,000
Tetrachloroethene	**6**	1	0.5 - 1.5	1.5	3.4
Tetrahydrofuran	**140**	6	0 - 2.5	9.4	21
Toluene	**820**	6	0 - 2.5	520	520
Trichloroethene	**200**	2	0 - 4	0.053	0.11
Xylene	27	6	0 - 2.5	270	420
Semivolatile Organic Compounds					
Benzo(a)anthracene	**550**	6	0 - 2.5	0.62	2.1
Benzo(a)pyrene	**540**	6	0 - 2.5	0.062	0.21
Benzo(a)fluoranthene	860	6	0 - 2.5	NA	NA
Benzo(g,h,i)perylene	590	6	0 - 2.5	NA	NA
Benzo(k)fluoranthene	**310 J**	6	1 - 3	6.2	21
Chrysene	**970**	6	0 - 2.5	62	210
Di-n-butylphthalate	390	6	0 - 2.5	6,100	62,000
bis(2-Ethylhexyl)phthalate	**240 J**	6	0 - 2.5	35	120
Fluoranthene	1,400	6	1 - 3	2,300	22,000
Fluorene	280 J	6	0 - 2.5	2,700	26,000
Indeno(1,2,3-c,d)pyrene	**570**	6	0 - 2.5	0.62	2.1
Naphthalene	**210 J**	6	0 - 2.5	5.6	190
Phenanthrene	1,900	6	0 - 2.5	NA	NA

Table 2 – Constituents Detected in Surface Soil

Constituent	Concentration (mg/kg)	SWMU	Depth (ft bgs)	EPA Region 9 Residential PRG (mg/kg)	EPA Region 9 Industrial PRG (mg/kg)
Pyrene	2,700	6	0 - 2.5	2,300	29,000
Polychlorinated Biphenyls					
Aroclor 1254	*0.57*	6	0 - 2.5	0.22	0.74
Aroclor 1260	**8.5**	6	0 - 2.5	0.22	0.74

Notes:

Concentrations in bold exceed industrial soil target concentrations. Concentrations in italics exceed residential soil target concentrations. Table derived from the 1998 RFI (Heritage Environmental Services 1998a).

* = Because *cis*-1,2-dichloroethene (DCE) makes up as much as 90 percent of the total 1,2-DCE concentration, thePRG for *cis*-1,2-dichloroethene is used here.

EPA = U.S. Environmental Protection Agency

J = Estimated concentration

ft bgs = Feet below ground surface

mg/kg = Milligrams per kilogram

NA = Not available. EPA Region 9 has not established PRGs for these constituents.

PRG = Preliminary remediation goals (EPA 2002b).

RFI = Resource Conservation and Recovery Act Facility Investigation

SWMU = Solid waste management unit

Table 3 – Constituents Detected in Subsurface Soil

Constituent	Concentration (mg/kg)	SWMU	Depth (ft bgs)	EPA Region 9 Residential PRG (mg/kg)	EPA Region 9 Industrial PRG (mg/kg)
Metals					
Arsenic	**47.0**	4	2 - 4	0.39	1.6
Cadmium	21.0	4	2 - 4	37	450
Chromium	**13,000.0**	4	4 - 5	210	450
Lead	**1,000.0**	4	2 - 4	400	750
Nickel	1,800.0	4	2 - 3	16,000	20,000
Zinc	16,000.0	4	4 - 5	230,000	100,000
Cyanide					
Cyanide	*1,200*	3	3 - 5	1,200	12,000
Volatile Organic Compounds					
Acetone	440	1	7 - 10	1,600	6,000
Benzene	**18**	4	6 - 8	0.6	1.3
Carbon disulfide	11	4	2 - 4	360	720
Chlorobenzene	6	4	7 - 9	150	530
1,2-Dichloroethene (total)	*96*	2	8 - 12	43*	150*
1,2-Dichloropropane	**6**	1	7 - 10	0.34	0.74
Ethylbenzene	**75**	4	4 - 7	8.9	20
2-Hexanone	44	4	2 - 4	NA	NA
Methyl ethyl ketone	130	4	2 - 4	7,300	27,000
Styrene	100	4	6 - 8	1,700	1,700
Tetrahydrofuran	**45**	1	2 - 4	9.4	21
Toluene	67	4	6 - 8	520	520
Trichloroethene	**110**	1	7 - 10	1.5	3.4
Vinyl chloride	**60**	3	7 - 9	0.079	0.75
Xylene	**120**	4	6 - 8	270	420
Semivolatile Organic Compounds					
Acenaphthene	**30,000**	4	4 -5	3,700	29,000
Anthracene	7,000	4	4 -5	22,000	100,000
Benzo(a)anthracene	**91,000**	4	4 -5	0.62	2.1
Benzo(a)pyrene	**60,000**	4	4 -5	0.062	0.21
Benzo(a)fluoranthene	81,000	4	4 -5	NA	NA
Benzo(g,h,i)perylene	36,000	4	4 -5	NA	NA
Benzo(k)fluoranthene	**25,000**	4	4 -5	6.2	21

Table 3 – Constituents Detected in Subsurface Soil

Constituent	Concentration (mg/kg)	SWMU	Depth (ft bgs)	EPA Region 9 Residential PRG (mg/kg)	EPA Region 9 Industrial PRG (mg/kg)
Carbazole	**20,000**	4	4 -5	24	86
Chrysene	**77,000**	4	4 -5	62	210
Dibenz(a,h)anthracene	**8,400**	4	4 -5	0.062	0.21
Dibenzofuran	**32,000**	4	4 -5	290	3,100
1,3-Dichlorobenzene	**410**	4	7 - 9	16	63
1,4-Dichlorobenzene	**1,200**	4	7 - 9	3.4	7.9
bis(2-Ethylhexyl)phthalate	**1,600**	4	4 -5	35	120
Fluoranthene	**270,000**	4	4 -5	2,300	22,000
Fluorene	**46,000**	4	4 -5	2,700	26,000
Indeno(1,2,3-c,d)pyrene	**32,000**	4	4 -5	0.62	2.1
2-Methylnaphthene	**13,000**	4	4 -5	NA	NA
4-Methylphenol	**980 J**	4	2 - 4	310	3,100
Naphthalene	**19,000**	4	4 -5	5.6	190
Phenanthrene	350,000	4	4 -5	NA	NA
Pyrene	**260,000**	4	4 -5	2,300	29,000
1,2,4-Trichlorobenzene	**1,400**	4	7 - 9	650	3,000
Polychlorinated Biphenyls					
Aroclor 1254	**1.50**	4	2 - 4	0.22	0.74
Aroclor 1260	**7.5**	4	4 - 7	0.22	0.74

Notes:

Concentrations in bold exceed industrial soil target concentrations. Concentrations in italics exceed residential soil target concentrations. Table derived from the 1998 RFI (Heritage Environmental Services 1998a).

* = Because *cis*-1,2-dichloroethene (DCE) makes up as much as 90 percent of the total 1,2-DCE concentration, thePRG for *cis*-1,2-dichloroethene is used here.

EPA = U.S. Environmental Protection Agency
J = Estimated concentration
ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
NA = Not available. EPA Region 9 has not established PRGs for these constituents.
PRG = Preliminary remediation goals (EPA 2002b).
RFI = Resource Conservation and Recovery Act Facility Investigation
SWMU = Solid waste management unit

Surface Water

Surface water from Manufacturers Ditch near the facility is not contaminated. Surface water samples were collected during the RFI and as part of an additional investigation in 2000 (Heritage 1998a, 2000b). Figures 1, 2, and 3 show the sampling locations. Surface water was analyzed for VOCs, cyanide, and metals (both total and dissolved). Acetone and cyanide were detected in the RFI surface water samples (maximum concentrations of 76 µg/l and

40 µg/l) but at concentrations below the Iowa Criteria for Chemical Constituents for Type C waters (Iowa Administrative Code, Division 567, Chapter 61) (Heritage 1998a). Surface water samples collected in 2000 had detectable concentrations of dissolved barium (maximum of 99 µg/l) and dissolved cyanide (8 µg/l), but no detectable VOCs (Heritage 2000b). Again, concentrations were below the Iowa Criteria for Chemical Constituents.

Sediments

Sediment at the Collis facility is contaminated with metals and VOCs, but concentrations may be declining. Sediment samples were collected during the RFI and in an additional investigation in 2000 (Heritage 1998a, 2000b). Samples were analyzed for metals, cyanide, and VOCs. Figures 1, 2, and 3 show the sampling locations. In general, concentrations were much lower in samples from the 2000 sampling event than in those from the 1998 sampling event (Heritage 2000b). Moreover, no chlorinated VOCs were detected in samples from the 2000 event (Heritage 2000b).

Table 4 shows the maximum concentrations of a range of constituents found in sediment. The highest levels of contamination in sediment were in samples SD-04 and SD-05, which were collected from the ditch south of S. 19th Street. Sample SD-09 also had high concentrations of VOCs. However, SD-09 was collected at a distance of about 0.5 mile from the facility, and samples collected from locations between the facility and SD-09's location had lower concentrations of VOCs than SD-09. As a result, the contamination in SD-09 may be attributable to other facilities. The only metal that exceeds industrial or residential PRGs is chromium. The maximum concentration of chromium was 1,700 milligrams per kilogram (mg/kg), which exceeds the industrial PRG. Two VOCs were detected at concentrations above PRGs – one, 1,2-DCE, at concentrations above residential PRGs, and the other, VC, at concentrations above industrial PRGs. The maximum concentrations were 120 mg/kg and 310 mg/kg, respectively. Both VOC concentrations were estimated.

Table 4 – Constituents Detected in Sediment

Constituent	Concentration (mg/kg)	Sample	EPA Region 9 Residential PRG (mg/kg)	EPA Region 9 Industrial PRG (mg/kg)
Metals				
Chromium	**1,700.0**	SD-04	210	450
Nickel	31.0	SD-04	16,000	20,000
Zinc	2,900.0	SD-04	230,000	100,000
Cyanide				
Cyanide	49	SD-04	1,200	12,000
Volatile Organic Compounds				
Acetone	180	SD-04	1,600	6,000
1,2-Dichloroethene (total)	*120 J*	SD-05	43*	150*
Methyl ethyl ketone	38	SD-03	7,300	27,000
Toluene	5	SD-04	520	520
Vinyl Chloride	**310 J**	SD-05	0.079	0.75
Xylene	9.0	SD-04	270	420

Notes:

Concentrations in bold exceed industrial soil target concentrations. Concentrations in italics exceed residential soil target concentrations. Table derived from the 1998 RFI (Heritage Environmental Services 1998a). PRGs have not been established for sediment.

* = Because *cis*-1,2-dichloroethene (DCE) makes up as much as 90 percent of the total 1,2-DCE concentration, thePRG for *cis*-1,2-dichloroethene is used here.

EPA = U.S. Environmental Protection Agency

J = Estimated concentration

NA = Not available. EPA Region 9 has not established PRGs for these constituents.

mg/kg = Milligrams per kilogram

PRG = Preliminary remediation goals (EPA 2002b).

RFI = Resource Conservation and Recovery Act Facility Investigation

Indoor Air

Because of the presence of VOCs in shallow groundwater and surface soil at the facility, indoor air likely is contaminated with organic vapors. Vapors from contaminated soil and groundwater may intrude into buildings at the facility through cracks in the foundation or through underground electrical conduits or plumbing. No indoor air sampling has been conducted at Collis. However, EPA guidance can be used to determine if indoor air contamination is likely at the facility, and the Johnson-Ettinger model can be used to estimate indoor air concentrations at locations that meet the screening criteria (2002c). The results of the screening and models are provided in Appendices A and B.

The first level of the EPA's indoor air screening consists of two criteria, both of which are met at the Collis facility. First, environmental media at the site must be contaminated by constituents that are sufficiently volatile and

sufficiently toxic. Groundwater and soil at the facility are contaminated with several constituents that meet this standard, in particular, 1,1-DCE, 1,2-DCE, TCE, and VC in groundwater. Because most of the 1,2-DCE at the facility is *cis*-1,2-DCE (see Table 1), reported concentrations of total 1,2-DCE are considered *cis*-1,2-DCE for the purposes of screening and modeling. Second, the contaminated media must be present under inhabited buildings. Three wells – MW-2, MW-39, and PZ-40 – are located within 50 feet of the main building and have concentrations of VOCs that exceed EPA MCLs (see Figure 2 and Table 1). Because of the proximity of these wells to the main building and the excessive concentrations of VOCs in all three of these wells, it is reasonable to assume that groundwater under the main building is contaminated.

The next level of the EPA's indoor air screening compares the concentrations of contaminants to screening levels. Concentrations of VOCs in groundwater at Collis are high enough to raise concerns about potential indoor air contamination. The screening levels are based on concentrations needed to generate vapors in indoor air at levels that would exceed risk levels for ambient air. Tables 2 and 3 in Appendix A shows the maximum concentrations of select VOCs in groundwater, compared to the initial screening concentrations. The vapor attenuation factor of $5x10^{-4}$ was estimated based on depth to groundwater (only 2.5 feet bgs in the three wells nearest the facility) and the type of soil at the site (considered loamy sand for modeling purposes) (Heritage 1998a, 2000b). Based on this level of screening, 1,2-DCE, TCE, and VC may cause contamination of indoor air and should be included in any modeling.

The last level of the EPA's indoor air screening specifies the use of a model to estimate the risk generated by organic vapors in indoor air. Based on the results of Johnson-Ettinger models, volatilization of organic constituents in groundwater does cause an increase in risk and contaminated indoor air (see Appendix B). Table 5 shows the results of the Johnson-Ettinger models. Of the three compounds modeled, VC has an incremental risk above the minimum threshold of 10^{-6}. The hazard quotients, which estimate the noncarcinogenic risks, total less than 1, indicating that this component of risk is not significant.

Table 5 – Estimated Incremental Risk and Hazard Quotients, Indoor Air

Constituent	Concentration in Groundwater (µg/l)	Well	Date	Incremental Risk (carcinogen)	Hazard Quotient (noncarcinogen)
1,1-Dichloroethene	8	MW-39	May 1996	Not modeled	Not modeled
1,2-Dichloroethene (total)*	1,200	MW-2	July 1997	Not applicable	$9.89x10^{-2}$
cis-1,2-Dichloroethene	840	MW-2	September 2000	Not modeled	Not modeled
trans-1,2-Dichloroethene	56	MW-39	May 1996	Not modeled	Not modeled
Trichloroethene	92	MW-2	October 1997	$4.65x10^{-7}$	Not applicable
Vinyl chloride	200	MW-39	July 2000	$1.07x10^{-5}$	$5.67x10^{-2}$

Notes:

Concentrations in Table 5 are derived from the 1998 RFI and 2000 supplemental investigation (Heritage Environmental Services 1998a, 2000b, 2000c, 2000d).

* Because *cis*-1,2-dichloroethene (DCE) makes up as much as 90 percent of the total 1,2-DCE concentration, the total 1,2-DCE concentration was used as *cis*-1,2-DCE for modeling.

µg/l = micrograms per liter

Outdoor Air

Because confining features are absent, concentrations of organic vapors in outdoor air are probably not significant. Because most of the facility is covered with buildings, asphalt, gravel, and vegetation (Heritage 2000a), contamination of indoor or outdoor air with soil particulate likely is minimal.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table Potential Human Receptors (Under Current Conditions)							
"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	NO	NO	NO	YES	NO	NO	NO
Air (indoors)	NO	YES	NO	NO	NO	NO	NO
Soil (surface, e.g., <2 ft)	NO	NO	NO	YES	NO	NO	NO
~~Surface Water~~	–	–	–	–	–	–	–
Sediment	NO	NO	NO	YES	YES	NO	NO
Soil (subsurface e.g., >2 ft)	NO	NO	NO	YES	NO	NO	NO
~~Air (outdoors)~~	–	–	–	–	–	–	–

Instructions for Summary Exposure Pathway Evaluation Table

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.

2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheetto analyze major pathways).

__X__ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

[3]Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

Rationale and Reference(s)

Two media – surface water and outdoor air – can be excluded from further consideration, because no evidence indicates that these media are contaminated at the Collis facility.

All classes of receptors must be evaluated for potential exposure. Maps of the facility indicate the facility is surrounded by a fence (see Figure 2). However, it is unclear how high or how well maintained the fence is. As a result, trespassers on the property are possible. Collis is still operational and employs 285 employees, in 24 hour per day, 5 day per week operations (EPA 2001), so facility workers must be considered. No information is available about Collis's use of contract construction workers. However, it is likely that any onsite excavation, construction, or utility work would be performed by contract workers, and this class of receptors must be considered. The properties immediately south of Collis property are residential (see Figure 1), and a day care center and school are located within 1 mile of the facility (Switchboard.com 2003). The closest day care is the Stay N Play center, which is about 0.5 mile south of the Collis property. The property immediately east of the Collis facility is the Clinton Country Club. Because the country club operates an irrigation well (see Appendix C), recreational users may be exposed to contaminated groundwater; as a result, recreational uses should be considered. Finally, because Manufacturers Ditch is a perennial surface water body, it may be used by recreational fishermen. Therefore, food receptors must be included.

Contract workers may be exposed to contaminated soil. Because most surface soil at Collis is covered with pavement, crushed rock, buildings, or vegetation (Heritage 2000a), trespassers and Collis workers likely are not exposed to contaminated surface soil. Residential, day care, and recreational receptors are not likely to come into contact with contaminated surface soil at the Collis facility, which is surrounded by a fence. The facility's location in a developed area makes the use of the facility to grow food unlikely. However, any excavation workers might be exposed to contaminated soils and sediments.

Only contract excavation workers likely are exposed to contaminated subsurface soils. Facility workers, trespassers, nearby residents, and day care children likely do not come into contact with soils deeper than 2 feet bgs. The facility's location in a developed area makes the use of the facility to grow food unlikely.

No receptors likely are exposed to contaminated groundwater by ingestion. Appendix C provides a list of wells within 1 mile of the facility (Iowa Department of Natural Resources [IDNR] 2003). The surrounding community is part of a utility district that provides drinking water. The city utility does collect some of its drinking water from a well about 0.5 miles from the facility. However, this well is more than 2,000 feet deep, completed in the Cambrian sandstone and separated from the contaminated surface aquifers by thick confining beds (Heritage 1998a). Similarly, the wells at Western Ice and Swift & Co. are more than 1,000 feet deep. The potential for contamination to migrate into any of these wells is very low (Heritage 1998a). A second municipal well that is only 165 feet deep is located at the city's sewage treatment plant (IDNR 2003). Because of its location, it is unlikely that this well is used to provide drinking water. As a result, facility workers, contract workers, trespassers, recreational users, nearby residents, day care children, and food consumers all are unlikely to be exposed to contaminated groundwater through ingestion.

Groundwater exposure pathways also may be completed by dermal contact. Unattended monitoring wells provide a pathway through which trespassers could be exposed to contaminated groundwater. However, the standard practice of padlocking well covers make completion of this pathway unlikely. Wells used by the Collis facility and surrounding industrial and recreational operations also are deep. The Collis process well is more than 1,600 feet deep, and the well used to irrigate the golf course is more than 850 feet deep. As a result, it is unlikely that facility workers or recreational users would be exposed to contaminated groundwater through dermal contact. Of the wells located within 1 mile of the facility, three are less than 200 feet deep. These wells are all designated as private use, and they are located in residential neighborhoods. However, none of these wells are located downgradient from the Collis facility and are, therefore, not likely to be contaminated by releases from the Collis facility. As a result,

residential and day-care exposure to contaminated groundwater can be excluded. However, because the water table at the site is as shallow as 2.5 feet bgs, contract excavation workers may come into dermal contact with contaminated groundwater.

Only facility employees likely are exposed to contaminated indoor air. Although contract construction and utility workers may spend time indoors at the Collis facility, their exposure to organic vapors typically would be limited in duration. Trespassers, recreational users, nearby residents, and day care students would not be expected to spend any time indoors at Collis and therefore would not be exposed. Currently, the facility is not operating a soil-vapor extraction system or any other remediation system to control the infiltration of organic vapors from groundwater. As a result, facility workers likely are being exposed to VOCs in indoor air.

Trespassers and construction workers may be exposed to contaminated sediment. However, Manufacturers Ditch is not part of an operational area of the facility. As a result, it is unlikely that facility workers would be exposed to contaminated sediment in the course of their normal operations. In addition, because of the low flow of the stream and the industrial setting of the ditch in the area of the facility, it is unlikely that recreational, residential, or day-care receptors would be making use of the ditch (Heritage 1998a), and these exposure pathways can be excluded. Given the low flow in the ditch and its industrial setting, any food use probably is uncommon or sporadic. As a result, the food pathway can be excluded. However, trespassers may come into contact with contaminated sediment. Contract construction, excavation, or utility workers may be exposed to sediment when maintaining or repairing the facilities permitted outfall.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

__X__ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Exposures can be considered significant if the duration or intensity of exposure to contaminated materials exceeds calculated screening levels or if the level of contamination substantially exceeds screening levels. Completed exposure pathways at Collis include:

1. contract construction workers – groundwater, surface soil, subsurface soil, and sediment
2. facility workers – indoor air
3. trespassers – sediment

While repairing or installing utilities or other excavation work, contract construction workers and utility workers would be exposed to contaminated groundwater, surface soil, subsurface soil, and sediment with concentrations of contaminants that exceed EPA Region 9 PRGs. However, because they are not full-time employees on site, their exposure is limited in duration. EPA Region 9 industrial PRGs for soil are calculated based on assumptions of 25 years, 250 days per year, of exposure (EPA 2002b). Because of the limited period of contact, exposure of contract construction workers to hazardous constituents in soil or sediment likely is not significant. Groundwater target concentrations are based predominantly on ingestion of water and are not applicable to dermal contact alone. The level of exposure of contract construction and utility workers to hazardous constituents in groundwater likely is not significant.

Because the channel of Manufacturers Ditch is open to the air, trespassers may come into contact with contaminated sediments. However, it is unlikely that trespassers will spend significant amounts of time in the ditch, given the low

---

[4]If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

flow of the stream and the industrial setting of the ditch in the area of the facility. As a result, the exposure of trespassers to hazardous constituents in sediment likely is not significant.

Collis facility workers could be exposed to contaminated indoor air as a result of contaminated groundwater that flows beneath the facility. VOC vapors from contaminated groundwater could enter the facility through cracks in the floors and foundation. Results of the vapor intrusion screening indicate that potential contamination could result from VOC contamination of soils and groundwater present at Collis (see Appendix A). Based on the model, only VC exceeded a 10^{-6} incremental risk, with a value of 1.1×10^{-5}. However, because the incremental risk from VC is less than 10^{-4}, it is not significant.

5. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

6. Check the appropriate RCRA Info status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

__X__ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Collis Inc. facility, EPA ID #IAD047303771, located at 2005 S. 19th Street, Clinton, Iowa, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

_____ NO - "Current Human Exposures" are NOT "Under Control."

_____ IN - More information is needed to make a determination.

Completed by Wray Rohrman Date 9-26-03
(signature)
Wray Rohrman
Project Manager, RCRA Corrective Action & Permits Branch
EPA Region 7

Supervisor [signature] Date 9/29/03
(signature)
John Smith
Branch Chief, RCRA Corrective Action & Permits Branch
EPA Region 7

Locations where References may be found:

EPA Region 7 Headquarters
RCRA Files
901 North 5th Street
Kansas City, Kansas 66101

Contact telephone and e-mail numbers

Wray Rohrman
(913) 551-7543
rohrman.wray@epa.gov

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

REFERENCES

Environmental Protection Agency, U.S. (EPA). 2001. "Report of RCRA Compliance Inspection at Collis, Inc." March 14.

EPA. 2002a. "List of Contaminants and their MCLs (Maximum Contaminant Levels)." EPA 816-F-02-013. July.

EPA. 2002b. "Region 9 Preliminary Remediation Goals." October 10.

EPA. 2002c. "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils." November 29.

Heritage Environmental Services, LLC (Heritage). 1994. "RCRA (Resource Conservation and Recovery Act) Facility Investigation Current Conditions Report, Collis, Inc." January 27.

Heritage. 1998a. "Final Remedial Facility Investigation Report, Collis, Inc." March 27.

Heritage. 1998b. "Response to RFI (RCRA Facility Investigation) Review Comments." October 1.

Heritage. 2000a. "RCRA Facility Investigation Corrective Measures Work Plan, Collis, Inc." January 12.

Heritage. 2000b. "Summary of Additional Investigative Activities Interim Report." September 29.

Heritage. 2000c. "Progress Report 47: RCRA Facility Investigation, Collis, Inc." November 7.

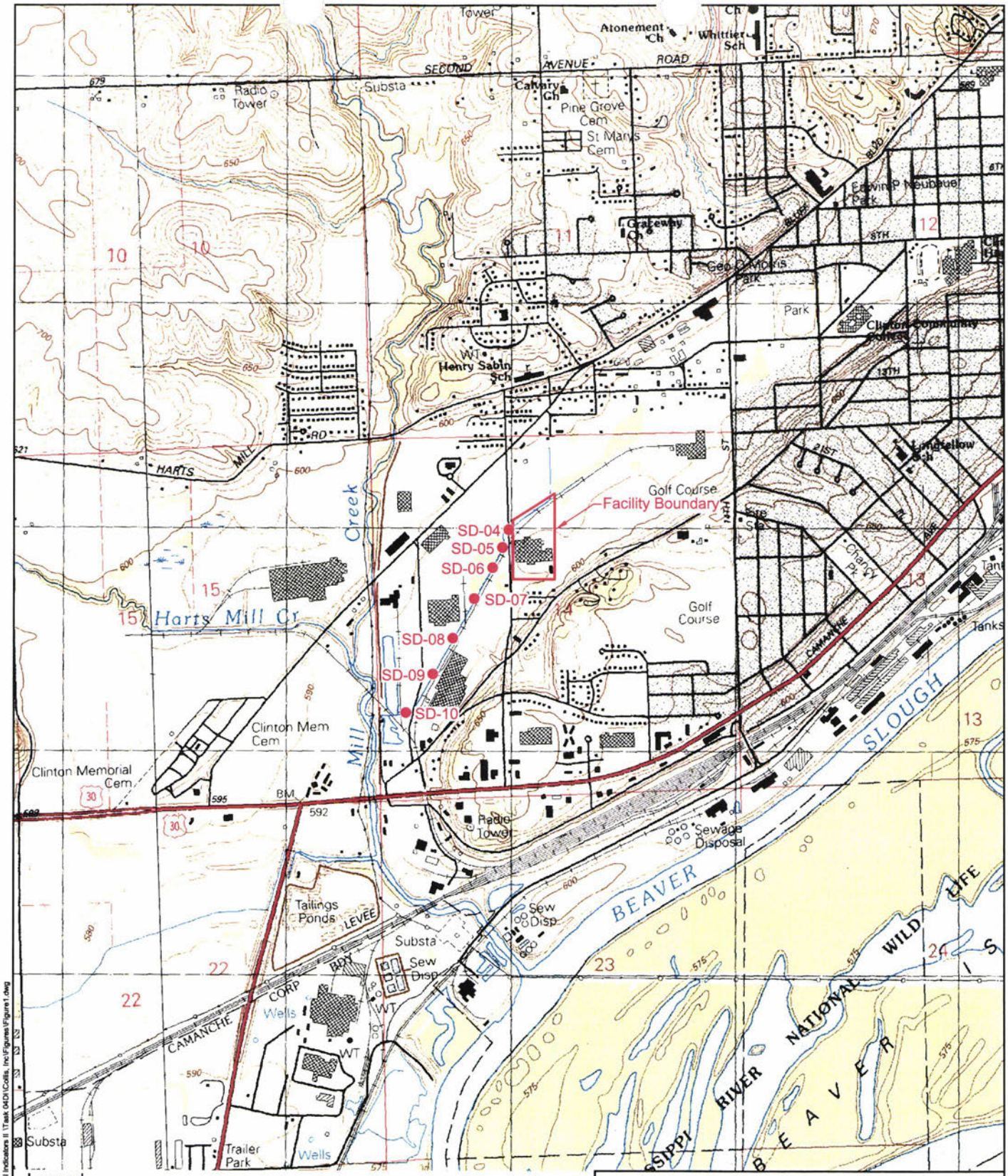
Heritage. 2000d. "Progress Report 48: RCRA Facility Investigation, Collis, Inc." December 8.

Iowa Department of Natural Resources. 2003. "GEOSAM." Accessed on August 19. On-line Address: http://gsbdata.igsb.uiowa.edu/geosam/

Switchboard.com. 2003. Accessed on August 22. On-line Address: www.switchboard.com

FIGURES

(3 pages)



Collis Corporation
Clinton, Iowa

Figure 1
Site Location Map with
Sediment Sampling Locations

Tetra Tech EM Inc.

Date: 9/2/03 Drawn By: Colin Willits Project No: G9017.0.R.07.1.19.04.DI

Fence
MW-30
MW-31
MW-32
MW-22A
MW-22
SWMU #6
MW-33
SWMU #4
MW-42
MW-13
MW-34
PZ-41
GW-6
SWMU #7
Manufacturers Ditch
PZ-40
Main Building
Asphalt Parking Lot
SWMU #2
SWMU #1
SWMU #3
MW-35
GW-7
C & N.W. R.R.
MW-36
SWMU #5
Outfall
MW-2
Fence
SD-12/SW-12
MW-43
MW-37
MW-38
MW-39
SOUTH 19TH STREET
SD-13/SW-13
SD-14/SW-14
GW-8
SD-15/SW-15
GW-9
SD-15/SW-15

Legend

Solid Waste Management Unit with ID

Source: Modified from Heritage Environmental Services, Inc. 2000

N

Not to Scale

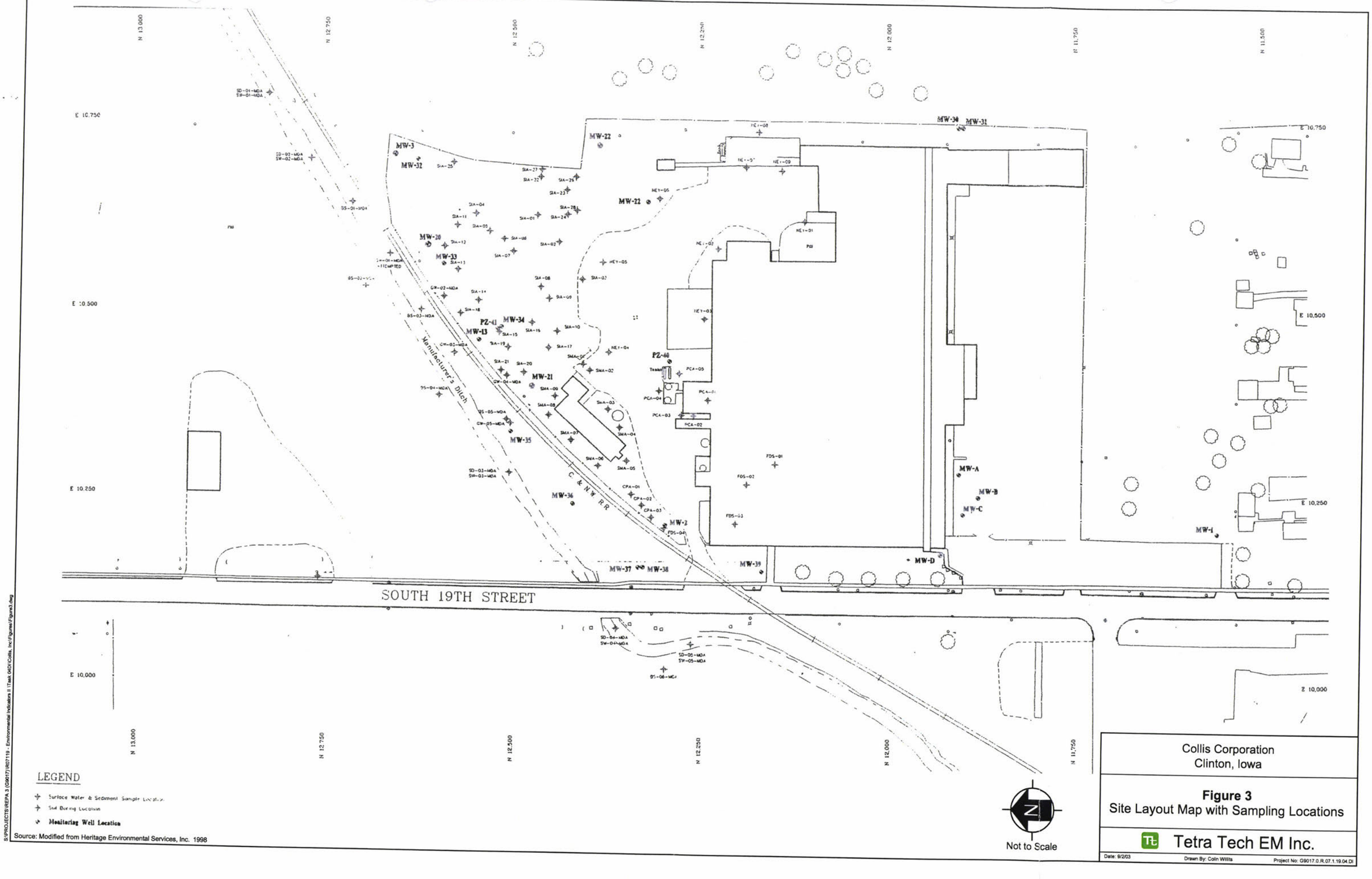
Collis Corporation
Clinton, Iowa

Figure 2
Site Layout Map

Tetra Tech EM Inc.

Date: 9/2/03 Drawn By: Colin Willits Project No: G9017.0.R.07.1.19.04.DI

S:\PROJECTS\REPA 3 (G9017)\90719 - Environmental Indicators II \Task 04D\Collis, Inc\Figures\Figure2.dwg


N 13,000
N 12,750
N 12,500
N 12,250
N 12,000
N 11,750
N 11,500
E 10,750
E 10,500
E 10,250
E 10,000
MW-3
MW-32
MW-22
MW-34
MW-31
MW-20
MW-33
MW-13
PZ-41
MW-21
MW-35
MW-36
MW-2
MW-37
MW-38
MW-39
PZ-40
MW-A
MW-B
MW-C
MW-D
MW-1
Manufacturer's Ditch
C & NW RR
SOUTH 19TH STREET
LEGEND
Surface Water & Sediment Sample Location
Soil Boring Location
Monitoring Well Location
Source: Modified from Heritage Environmental Services, Inc. 1998
N
Not to Scale
Collis Corporation
Clinton, Iowa
Figure 3
Site Layout Map with Sampling Locations
Tetra Tech EM Inc.
Date: 9/2/03
Drawn By: Colin Willits
Project No: G9017.0.R.07.1.19.04.DI
S:\PROJECTS\IEPA 3 (G9017)\G7119 - Environmental Indicators II \Task 04DI\Collis, Inc\Figures\Figure3.dwg

APPENDIX A

COLLIS INC. INDOOR AIR SCREENING

VAPOR INTRUSION PATHWAY SUMMARY PAGE

Facility Name: Collis Inc. (IAD047303771)
Facility Address: 2005 S. 19th Street, Clinton, IA 52732

Primary Screening Summary

Q1: Constituents of concern Identified?
__X__ *Yes*
_____ *No* (If NO, skip to the conclusion section below and check NO to indicate the pathway is *incomplete*.)

Q2: Currently inhabited buildings near subsurface contamination?
__X__ *Yes*
_____ *No*

Areas of future concern near subsurface contamination?
__X__ *Yes*
_____ *No* (If NO, skip to the conclusion section below and check NO to indicate the pathway is *incomplete*.)

Q3: Immediate Actions Warranted?
_____ *Yes*
__X__ *No*

Secondary Screening Summary

Vapor source identified:
__X__ *Groundwater*
__X__ *Soil*
_____ *Insufficient Data*

Indoor air data available?
_____ *Yes*
__X__ *No*

Indoor air concentrations exceed target levels?
_____ *Yes*
_____ *No*
__X__ *Not applicable*

Subsurface data evaluation: (Underline appropriate answers below)

Medium	Q4 Levels Exceeded?	Q5 Levels Exceeded?	Data Indicates Pathway is Complete?
Groundwater	***YES*** / NO / NA / INS	***YES*** / NO / NA / INS	***YES*** / NO / INS
Soil Gas	YES / NO / NA / ***INS***	YES / NO / NA / ***INS***	YES / NO / ***INS***

Notes:

NA Not applicable
INS Insufficient data available to make a determination

Site-Specific Summary

Have the nature and extent of subsurface contamination, potential preferential pathways, and overlaying building characteristics been adequately characterized to identify the most-likely-to-be-impacted buildings?
__X__Yes
_____No
_____N/A

EPA recommends that if a model was used, it be an appropriate and applicable model that represents the conceptual site model. If other means were used, document how you determined the potentially most impacted areas to sample. EPA recommends that predictive modeling can be used to support Current Human Exposures Under Control EI determinations without confirmatory sampling to support this determination. Current Human Exposures Under Control EI determinations are intended to reflect a reasonable conclusion by EPA or the State that current human exposures are under control with regard to the vapor intrusion pathway and current land use conditions. Therefore, if conducting evaluation for an EI determination, document that the **Pathway is Incomplete** and/or does not pose an unacceptable risk to human health for EI determinations.

Are you making an EI determination based on modeling and does the model prediction indicate that determination is expected to be adequately protective to support Current Human Exposures Under Control EI determinations?
_____Yes
_____No
_____N/A

Do subslab vapor concentrations exceed target levels?
_____Yes
_____No
_____N/A

Do indoor air concentrations exceed target levels?
_____Yes
_____No

Conclusion

Is there a Complete Pathway for subsurface vapor intrusion to indoor air?

Below, check the appropriate conclusion for the Subsurface Vapor to Indoor Air Pathway evaluation and attach supporting documentation as well as a map of the facility.

_____NO - The "Subsurface Vapor Intrusion to Indoor Air Pathway" has been verified to be incomplete for the _____facility, EPA ID #_, located at_____

This determination is based on a review of site information, as suggested in this guidance, check as appropriate:

_____For current and reasonably expected conditions, or
_____Based on performance monitoring evaluations for engineered exposure controls. This determination may be re-evaluated, where appropriate, when the Agency/State becomes aware of any significant changes at the facility.

__*X*__YES - The "Subsurface Vapor Intrusion to Indoor Air Pathway" is Complete. Engineered controls, avoidance actions, or removal actions taken include:
None

_____UNKNOWN - More information is needed to make a determination.

Table 1: Question 1 Summary Sheet.

CAS No.	Chemical	Is Chemical Sufficiently Toxic? [1]	Is Chemical Sufficiently Volatile? [2]	Check Here if Known or Reasonably Suspected To Be Present [3]
83329	Acenaphthene	YES	YES	
75070	Acetaldehyde	YES	YES	
67641	Acetone	YES	YES	
75058	Acetonitrile	YES	YES	
98862	Acetophenone	YES	YES	
107028	Acrolein	YES	YES	
107131	Acrylonitrile	YES	YES	
309002	Aldrin	YES	YES	
319846	alpha-HCH (alpha-BHC)	YES	YES	
62533	Aniline	YES	NO	NA
120127	Anthracene	NO	YES	NA
56553	Benz(a)anthracene	YES	NO	NA
100527	Benzaldehyde	YES	YES	
71432	Benzene	YES	YES	
50328	Benzo(a)pyrene	YES	NO	NA
205992	Benzo(b)fluoranthene	YES	YES	
207089	Benzo(k)fluoranthene	NO	NO	NA
65850	Benzoic Acid	NO	NO	NA
100516	Benzyl alcohol	YES	NO	NA
100447	Benzylchloride	YES	YES	
91587	beta-Chloronaphthalene	YES	YES	
319857	beta-HCH (beta-BHC)	YES	NO	NA
92524	Biphenyl	YES	YES	
111444	Bis(2-chloroethyl)ether	YES	YES	
108601	Bis(2-chloroisopropyl)ether	YES	YES	
117817	Bis(2-ethylhexyl)phthalate	NO	NO	NA
542881	Bis(chloromethyl)ether	YES	YES	
75274	Bromodichloromethane	YES	YES	
75252	Bromoform	YES	YES	
106990	1,3-Butadiene	YES	YES	
71363	Butanol	YES	NO	NA
85687	Butyl benzyl phthalate	NO	NO	NA
86748	Carbazole	YES	NO	NA
75150	Carbon disulfide	YES	YES	
56235	Carbon tetrachloride	YES	YES	
57749	Chlordane	YES	YES	
126998	2-Chloro-1,3-butadiene (chloroprene)	YES	YES	
108907	Chlorobenzene	YES	YES	
109693	1-Chlorobutane	YES	YES	
124481	Chlorodibromomethane	YES	YES	
75456	Chlorodifluoromethane	YES	YES	
75003	Chloroethane (ethyl chloride)	YES	YES	
67663	Chloroform	YES	YES	
95578	2-Chlorophenol	YES	YES	
75296	2-Chloropropane	YES	YES	
218019	Chrysene	YES	YES	
156592	cis-1,2-Dichloroethylene	YES	YES	✓
123739	Crotonaldehyde (2-butenal)	YES	YES	
98828	Cumene	YES	YES	
72548	DDD	YES	NO	NA
72559	DDE	YES	YES	
50293	DDT	YES	NO	NA
53703	Dibenz(a,h)anthracene	YES	NO	NA
132649	Dibenzofuran	YES	YES	
96128	1,2-Dibromo-3-chloropropane	YES	YES	
106934	1,2-Dibromoethane (ethylene dibromide)	YES	YES	
541731	1,3-Dichlorobenzene	YES	YES	
95501	1,2-Dichlorobenzene	YES	YES	
106467	1,4-Dichlorobenzene	YES	YES	
91941	3,3-Dichlorobenzidine	YES	NO	NA
75718	Dichlorodifluoromethane	YES	YES	

Table 1: Question 1 Summary Sheet.

CAS No.	Chemical	Is Chemical Sufficiently Toxic? [1]	Is Chemical Sufficiently Volatile? [2]	Check Here if Known or Reasonably Suspected To Be Present [3]
75343	1,1-Dichloroethane	YES	YES	
107062	1,2-Dichloroethane	YES	YES	
75354	1,1-Dichloroethylene	YES	YES	✓
120832	2,4-Dichlorophenol	YES	NO	NA
78875	1,2-Dichloropropane	YES	YES	
542756	1,3-Dichloropropene	YES	YES	
60571	Dieldrin	YES	YES	
84662	Diethylphthalate	YES	NO	NA
105679	2,4-Dimethylphenol	YES	NO	NA
131113	Dimethylphthalate	NA	NO	NA
84742	Di-n-butyl phthalate	NO	NO	NA
534521	4,6-Dinitro-2-methylphenol (4,6-dinitro-o-cresol)	YES	NO	NA
51285	2,4-Dinitrophenol	YES	NO	NA
121142	2,4-Dinitrotoluene	YES	NO	NA
606202	2,6-Dinitrotoluene	YES	NO	NA
117840	Di-n-octyl phthalate	NO	YES	NA
115297	Endosulfan	YES	YES	
72208	Endrin	YES	NO	NA
106898	Epichlorohydrin	YES	YES	
60297	Ethyl ether	YES	YES	
141786	Ethylacetate	YES	YES	
100414	Ethylbenzene	YES	YES	
75218	Ethylene oxide	YES	YES	
97632	Ethylmethacrylate	YES	YES	
206440	Fluoranthene	NO	YES	NA
86737	Fluorene	YES	YES	
110009	Furan	YES	YES	
58899	gamma-HCH (Lindane)	YES	YES	
76448	Heptachlor	YES	YES	
1024573	Heptachlor epoxide	YES	NO	NA
87683	Hexachloro-1,3-butadiene	YES	YES	
118741	Hexachlorobenzene	YES	YES	
77474	Hexachlorocyclopentadiene	YES	YES	
67721	Hexachloroethane	YES	YES	
110543	Hexane	YES	YES	
74908	Hydrogen cyanide	YES	YES	
193395	Indeno(1,2,3-cd)pyrene	NO	NO	NA
78831	Isobutanol	YES	YES	
78591	Isophorone	YES	NO	NA
7439976	Mercury (elemental)	YES	YES	
126987	Methacrylonitrile	YES	YES	
72435	Methoxychlor	YES	YES	
79209	Methyl acetate	YES	YES	
96333	Methyl acrylate	YES	YES	
74839	Methyl bromide	YES	YES	
74873	Methyl chloride (chloromethane)	YES	YES	
108872	Methylcyclohexane	YES	YES	
74953	Methylene bromide	YES	YES	
75092	Methylene chloride	YES	YES	
78933	Methylethylketone (2-butanone)	YES	YES	
108101	Methylisobutylketone	YES	YES	
80626	Methylmethacrylate	YES	YES	
91576	2-Methylnaphthalene	YES	YES	
108394	3-Methylphenol (m-cresol)	YES	NO	NA
95487	2-Methylphenol (o-cresol)	YES	NO	NA
106455	4-Methylphenol (p-cresol)	YES	NO	NA
99081	m-Nitrotoluene	YES	NO	NA
1634044	MTBE	YES	YES	
108383	m-Xylene	YES	YES	
91203	Naphthalene	YES	YES	
104518	n-Butylbenzene	YES	YES	

Table 1: Question 1 Summary Sheet.

CAS No.	Chemical	Is Chemical Sufficiently Toxic? [1]	Is Chemical Sufficiently Volatile? [2]	Check Here if Known or Reasonably Suspected To Be Present [3]
98953	Nitrobenzene	YES	YES	
100027	4-Nitrophenol	YES	NO	NA
79469	2-Nitropropane	YES	YES	
924163	N-Nitroso-di-n-butylamine	YES	YES	
621647	N-Nitrosodi-n-propylamine	YES	NO	NA
86306	N-Nitrosodiphenylamine	YES	NO	NA
103651	n-Propylbenzene	YES	YES	
88722	o-Nitrotoluene	YES	YES	
95476	o-Xylene	YES	YES	
106478	p-Chloroaniline	YES	NO	NA
87865	Pentachlorophenol	YES	NO	NA
108952	Phenol	YES	NO	NA
99990	p-Nitrotoluene	YES	NO	NA
106423	p-Xylene	YES	YES	
129000	Pyrene	YES	YES	
110861	Pyridine	YES	NO	NA
135988	sec-Butylbenzene	YES	YES	
100425	Styrene	YES	YES	
98066	tert-Butylbenzene	YES	YES	
630206	1,1,1,2-Tetrachloroethane	YES	YES	
79345	1,1,2,2-Tetrachloroethane	YES	YES	
127184	Tetrachloroethylene	YES	YES	
108883	Toluene	YES	YES	
8001352	Toxaphene	YES	NO	NA
156605	trans-1,2-Dichloroethylene	YES	YES	✓
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	YES	YES	
120821	1,2,4-Trichlorobenzene	YES	YES	
79005	1,1,2-Trichloroethane	YES	YES	
71556	1,1,1-Trichloroethane	YES	YES	
79016	Trichloroethylene	YES	YES	✓
75694	Trichlorofluoromethane	YES	YES	
95954	2,4,5-Trichlorophenol	YES	NO	NA
88062	2,4,6-Trichlorophenol	YES	NO	NA
96184	1,2,3-Trichloropropane	YES	YES	
95636	1,2,4-Trimethylbenzene	YES	YES	
108678	1,3,5-Trimethylbenzene	YES	YES	
108054	Vinyl acetate	YES	YES	
75014	Vinyl chloride (chloroethene)	YES	YES	✓

[1] A chemical is considered sufficiently toxic if the vapor concentration of the pure component (see Appendix D) poses an incremental lifetime cancer risk greater than 10^{-6} or a non-cancer hazard index greater than 1.

[2] A chemical is considered sufficiently volatile if its Henry's Law Constant is 1 x 10^{-5} atm-m^3/mol or greater (US EPA, 1991).

[3] Users should check off compounds that meet the criteria for toxicity and volatility and are known or reasonably suspected to be present.

Table 2a: Question 4 Generic Screening Levels and Summary Sheet [1]

Risk = 1 x 10^{-4}

CAS No.	Chemical	Compounds with Provisional Toxicity Data Extrapolated From Oral Sources	Basis of Target Concentration C=cancer risk NC=noncancer risk	Target Indoor Air Concentration to Satisfy Both the Prescribed Risk Level and the Target Hazard Index [R=10^{-4}, HI=1) C_{target} (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Indoor Air Concentration [if available] (specify units)	Target Shallow Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.1 $C_{soil-gas}$ (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Shallow Soil Gas Concentration [if available] (specify units)	Target Deep Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.01 $C_{soil-gas}$ (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Deep Soil Gas Concentration [if available] (specify units)	Target Groundwater Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor = 0.001 and Partitioning Across the Water Table Obeys Henry's Law C_{gw} (ug/L)	Measured or Reasonably Estimated Groundwater Concentration [if available] (specify units)
83329	Acenaphthene	X	NC	2.1E+02	3.3E+01		2.1E+03	3.3E+02		2.1E+04	3.3E+03		**	
75070	Acetaldehyde		NC	9.0E+00	5.0E+00		9.0E+01	5.0E+01		9.0E+02	5.0E+02		2.8E+03	
67641	Acetone	X	NC	3.5E+02	1.5E+02		3.5E+03	1.5E+03		3.5E+04	1.5E+04		2.2E+05	
75058	Acetonitrile		NC	6.0E+01	3.6E+01		6.0E+02	3.6E+02		6.0E+03	3.6E+03		4.2E+04	
98862	Acetophenone	X	NC	3.5E+02	7.1E+01		3.5E+03	7.1E+02		3.5E+04	7.1E+03		8.0E+05	
107028	Acrolein		NC	2.0E-02	8.7E-03		2.0E-01	8.7E-02		2.0E+00	8.7E-01		4.0E+00	
107131	Acrylonitrile		NC	2.0E+00	9.2E-01		2.0E+01	9.2E+00		2.0E+02	9.2E+01		4.7E+02	
309002	Aldrin		C	5.0E-02	3.3E-03		5.0E-01	3.3E-02		5.0E+00	3.3E-01		7.1E+00	
319846	alpha-HCH (alpha-BHC)		C	1.4E-01	1.1E-02		1.4E+00	1.1E-01		1.4E+01	1.1E+00		3.1E+02	
100527	Benzaldehyde	X	NC	3.5E+02	8.1E+01		3.5E+03	8.1E+02		3.5E+04	8.1E+03		3.6E+05	
71432	Benzene		C	3.1E+01	9.8E+00		3.1E+02	9.8E+01		3.1E+03	9.8E+02		1.4E+02	
205992	Benzo(b)fluoranthene	X	C	1.2E+00	1.1E-01		**	**		**	**		**	
100447	Benzylchloride	X	C	5.0E+00	9.7E-01		5.0E+01	9.7E+00		5.0E+02	9.7E+01		3.0E+02	
91587	beta-Chloronaphthalene	X	NC	2.8E+02	4.2E+01		2.8E+03	4.2E+02		2.8E+04	4.2E+03		**	
92524	Biphenyl	X	NC	1.8E+02	2.8E+01		1.8E+03	2.8E+02		1.8E+04	2.8E+03		**	
111444	Bis(2-chloroethyl)ether		C	7.4E-01	1.3E-01		7.4E+00	1.3E+00		7.4E+01	1.3E+01		1.0E+03	
108601	Bis(2-chloroisopropyl)ether		C	2.4E+01	3.5E+00		2.4E+02	3.5E+01		2.4E+03	3.5E+02		5.1E+03	
542881	Bis(chloromethyl)ether		C	3.9E-03	8.4E-04		3.9E-02	8.4E-03		3.9E-01	8.4E-02		4.5E-01	
75274	Bromodichloromethane	X	C	1.4E+01	2.1E+00		1.4E+02	2.1E+01		1.4E+03	2.1E+02		2.1E+02	
75252	Bromoform		C	2.2E+02	2.1E+01		2.2E+03	2.1E+02		2.2E+04	2.1E+03		8.3E-01	
106990	1,3-Butadiene		C	8.7E-01	3.9E-01		8.7E+00	3.9E+00		8.7E+01	3.9E+01		2.9E-01	
75150	Carbon disulfide		NC	7.0E+02	2.2E+02		7.0E+03	2.2E+03		7.0E+04	2.2E+04		5.6E+02	
56235	Carbon tetrachloride		C	1.6E+01	2.6E+00		1.6E+02	2.6E+01		1.6E+03	2.6E+02		1.3E+01	
57749	Chlordane		NC	7.0E-01	4.2E-02		7.0E+00	4.2E-01		7.0E+01	4.2E+00		**	
126998	2-Chloro-1,3-butadiene (chloroprene)		NC	7.0E+00	1.9E+00		7.0E+01	1.9E+01		7.0E+02	1.9E+02		1.4E+01	
108907	Chlorobenzene		NC	6.0E+01	1.3E+01		6.0E+02	1.3E+02		6.0E+03	1.3E+03		3.9E+02	
109693	1-Chlorobutane	X	NC	1.4E+03	3.7E+02		1.4E+04	3.7E+03		1.4E+05	3.7E+04		2.0E+03	
124481	Chlorodibromomethane	X	C	1.0E+01	1.2E+00		1.0E+02	1.2E+01		1.0E+03	1.2E+02		3.2E+02	
75456	Chlorodifluoromethane		NC	5.0E+04	1.4E+04		5.0E+05	1.4E+05		**	**		**	
75003	Chloroethane (ethyl chloride)		NC	1.0E+04	3.8E+03		1.0E+05	3.8E+04		1.0E+06	3.8E+05		2.8E+04	
67663	Chloroform		C	1.1E+01	2.2E+00		1.1E+02	2.2E+01		1.1E+03	2.2E+02		8.0E+01 [†]	
95578	2-Chlorophenol	X	NC	1.8E+01	3.3E+00		1.8E+02	3.3E+01		1.8E+03	3.3E+02		1.1E+03	
75296	2-Chloropropane		NC	1.0E+02	3.2E+01		1.0E+03	3.2E+02		1.0E+04	3.2E+03		1.7E+02	
218019	Chrysene	X	•	•	•		•	•		•	•		•	
156592	cis-1,2-Dichloroethylene	X	NC	3.5E+01	8.8E+00		3.5E+02	8.8E+01		3.5E+03	8.8E+02		2.1E+02	1,200 µg/l (total DCE)
123739	Crotonaldehyde (2-butenal)	X	C	4.5E-01	1.6E-01		4.5E+00	1.6E+00		4.5E+01	1.6E+01		5.6E+02	
98828	Cumene		NC	4.0E+02	8.1E+01		4.0E+03	8.1E+02		4.0E+04	8.1E+03		8.4E+00	

Table 2a: Question 4 Generic Screening Levels and Summary Sheet [1]
Risk = 1 x 10^{-4}

CAS No.	Chemical	Compounds with Provisional Toxicity Data Extrapolated From Oral Sources	Basis of Target Concentration C=cancer risk NC=noncancer risk	Target Indoor Air Concentration to Satisfy Both the Prescribed Risk Level and the Target Hazard Index [R=10^{-4}, HI=1] C_{target} (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Indoor Air Concentration [if available] (specify units)	Target Shallow Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.1 $C_{soil-gas}$ (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Shallow Soil Gas Concentration [if available] (specify units)	Target Deep Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.01 $C_{soil-gas}$ (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Deep Soil Gas Concentration [if available] (specify units)	Target Groundwater Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor = 0.001 and Partitioning Across the Water Table Obeys Henry's Law C_{gw} (ug/L)	Measured or Reasonably Estimated Groundwater Concentration [if available] (specify units)
72559	DDE	X	C	2.5E+00	1.9E-01		2.5E+01	1.9E+00		**	**		**	
132649	Dibenzofuran	X	NC	1.4E+01	2.0E+00		1.4E+02	2.0E+01		1.4E+03	2.0E+02		**	
96128	1,2-Dibromo-3-chloropropane		NC	2.0E-01	2.1E-02		2.0E+00	2.1E-01		2.0E+01	2.1E+00		3.3E+01	
106934	1,2-Dibromoethane (ethylene dibromide)		NC	2.0E-01	2.6E-02		2.0E+00	2.6E-01		2.0E+01	2.6E+00		6.6E+00	
541731	1,3-Dichlorobenzene	X	NC	1.1E+02	1.7E+01		1.1E+03	1.7E+02		1.1E+04	1.7E+03		8.3E+02	
95501	1,2-Dichlorobenzene		NC	2.0E+02	3.3E+01		2.0E+03	3.3E+02		2.0E+04	3.3E+03		2.6E+03	
106467	1,4-Dichlorobenzene		NC	8.0E+02	1.3E+02		8.0E+03	1.3E+03		8.0E+04	1.3E+04		8.2E+03	
75718	Dichlorodifluoromethane		NC	2.0E+02	4.0E+01		2.0E+03	4.0E+02		2.0E+04	4.0E+03		1.4E+01	
75343	1,1-Dichloroethane		NC	5.0E+02	1.2E+02		5.0E+03	1.2E+03		5.0E+04	1.2E+04		2.2E+03	
107062	1,2-Dichloroethane		C	9.4E+00	2.3E+00		9.4E+01	2.3E+01		9.4E+02	2.3E+02		2.3E+02	
75354	1,1-Dichloroethylene		NC	2.0E+02	5.0E+01		2.0E+03	5.0E+02		2.0E+04	5.0E+03		1.9E+02	8 ug/L
78875	1,2-Dichloropropane		NC	4.0E+00	8.7E-01		4.0E+01	8.7E+00		4.0E+02	8.7E+01		3.5E+01	
542756	1,3-Dichloropropene		NC	2.0E+01	4.4E+00		2.0E+02	4.4E+01		2.0E+03	4.4E+02		2.8E+01	
60571	Dieldrin		C	5.3E-02	3.4E-03		5.3E-01	3.4E-02		5.3E+00	3.4E-01		8.6E+01	
115297	Endosulfan	X	NC	2.1E+01	1.3E+00		2.1E+02	1.3E+01		**	**		**	
106898	Epichlorohydrin		NC	1.0E+00	2.6E-01		1.0E+01	2.6E+00		1.0E+02	2.6E+01		8.0E+02	
60297	Ethyl ether	X	NC	7.0E+02	2.3E+02		7.0E+03	2.3E+03		7.0E+04	2.3E+04		5.2E+02	
141786	Ethylacetate	X	NC	3.2E+03	8.7E+02		3.2E+04	8.7E+03		3.2E+05	8.7E+04		5.6E+05	
100414	Ethylbenzene		C	2.2E+02	5.1E+01		2.2E+03	5.1E+02		2.2E+04	5.1E+03		7.0E+02 [†]	
75218	Ethylene oxide		C	2.4E+00	1.4E+00		2.4E+01	1.4E+01		2.4E+02	1.4E+02		1.1E+02	
97632	Ethylmethacrylate	X	NC	3.2E+02	6.8E+01		3.2E+03	6.8E+02		3.2E+04	6.8E+03		9.1E+03	
86737	Fluorene	X	NC	1.4E+02	2.1E+01		1.4E+03	2.1E+02		**	**		**	
110009	Furan	X	NC	3.5E+00	1.3E+00		3.5E+01	1.3E+01		3.5E+02	1.3E+02		1.6E+01	
58899	gamma-HCH (Lindane)	X	C	6.6E-01	5.5E-02		6.6E+00	5.5E-01		6.6E+01	5.5E+00		1.1E+03	
76448	Heptachlor		C	1.9E-01	1.2E-02		1.9E+00	1.2E-01		1.9E+01	1.2E+00		4.0E-01 [†]	
87683	Hexachloro-1,3-butadiene		C	1.1E+01	1.0E+00		1.1E+02	1.0E+01		1.1E+03	1.0E+02		3.3E+01	
118741	Hexachlorobenzene		C	5.3E-01	4.5E-02		5.3E+00	4.5E-01		5.3E+01	4.5E+00		**	
77474	Hexachlorocyclopentadiene		NC	2.0E-01	1.8E-02		2.0E+00	1.8E-01		2.0E+01	1.8E+00		5.0E+01 [†]	
67721	Hexachloroethane		C	6.1E+01	6.3E+00		6.1E+02	6.3E+01		6.1E+03	6.3E+02		3.8E+02	
110543	Hexane		NC	2.0E+02	5.7E+01		2.0E+03	5.7E+02		2.0E+04	5.7E+03		2.9E+00	
74908	Hydrogen cyanide		NC	3.0E+00	2.7E+00		3.0E+01	2.7E+01		3.0E+02	2.7E+02		5.5E+02	
78831	Isobutanol	X	NC	1.1E+03	3.5E+02		1.1E+04	3.5E+03		1.1E+05	3.5E+04		2.2E+06	
7439976	Mercury (elemental)		NC	3.0E-01	3.7E-02		3.0E+00	3.7E-01		3.0E+01	3.7E+00		6.8E-01	
126987	Methacrylonitrile		NC	7.0E-01	2.6E-01		7.0E+00	2.6E+00		7.0E+01	2.6E+01		6.9E+01	
72435	Methoxychlor	X	NC	1.8E+01	1.2E+00		**	**		**	**		**	
79209	Methyl acetate	X	NC	3.5E+03	1.2E+03		3.5E+04	1.2E+04		3.5E+05	1.2E+05		7.2E+05	
96333	Methyl acrylate	X	NC	1.1E+02	3.0E+01		1.1E+03	3.0E+02		1.1E+04	3.0E+03		1.4E+04	

Table 2a: Question 4 Generic Screening Levels and Summary Sheet [1]

Risk = 1 x 10^{-4}

CAS No.	Chemical	Compounds with Provisional Toxicity Data Extrapolated From Oral Sources	Basis of Target Concentration C=cancer risk NC=noncancer risk	Target Indoor Air Concentration to Satisfy Both the Prescribed Risk Level and the Target Hazard Index [R=10^{-4}, HI=1] C_{target} (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Indoor Air Concentration [if available] (specify units)	Target Shallow Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.1 $C_{soil-gas}$ (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Shallow Soil Gas Concentration [if available] (specify units)	Target Deep Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.01 $C_{soil-gas}$ (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Deep Soil Gas Concentration [if available] (specify units)	Target Groundwater Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor = 0.001 and Partitioning Across the Water Table Obeys Henry's Law C_{gw} (ug/L)	Measured or Reasonably Estimated Groundwater Concentration [if available] (specify units)
74839	Methyl bromide		NC	5.0E+00	1.3E+00		5.0E+01	1.3E+01		5.0E+02	1.3E+02		2.0E+01	
74873	Methyl chloride (chloromethane)		NC	9.0E+01	4.4E+01		9.0E+02	4.4E+02		9.0E+03	4.4E+03		2.5E+02	
108872	Methylcyclohexane		NC	3.0E+03	7.5E+02		3.0E+04	7.5E+03		3.0E+05	7.5E+04		7.1E+02	
74953	Methylene bromide	X	NC	3.5E+01	4.9E+00		3.5E+02	4.9E+01		3.5E+03	4.9E+02		9.9E+02	
75092	Methylene chloride		C	5.2E+02	1.5E+02		5.2E+03	1.5E+03		5.2E+04	1.5E+04		5.8E+03	
78933	Methylethylketone (2-butanone)		NC	1.0E+03	3.4E+02		1.0E+04	3.4E+03		1.0E+05	3.4E+04		4.4E+05	
108101	Methylisobutylketone		NC	8.0E+01	2.0E+01		8.0E+02	2.0E+02		8.0E+03	2.0E+03		1.4E+04	
80626	Methylmethacrylate		NC	7.0E+02	1.7E+02		7.0E+03	1.7E+03		7.0E+04	1.7E+04		5.1E+04	
91576	2-Methylnaphthalene	X	NC	7.0E+01	1.2E+01		7.0E+02	1.2E+02		7.0E+03	1.2E+03		3.3E+03	
1634044	MTBE		NC	3.0E+03	8.3E+02		3.0E+04	8.3E+03		3.0E+05	8.3E+04		1.2E+05	
108383	m-Xylene	X	NC	7.0E+03	1.6E+03		7.0E+04	1.6E+04		7.0E+05	1.6E+05		2.3E+04	
91203	Naphthalene		NC	3.0E+00	5.7E-01		3.0E+01	5.7E+00		3.0E+02	5.7E+01		1.5E+02	
104518	n-Butylbenzene	X	NC	1.4E+02	2.6E+01		1.4E+03	2.6E+02		1.4E+04	2.6E+03		2.6E+02	
98953	Nitrobenzene		NC	2.0E+00	4.0E-01		2.0E+01	4.0E+00		2.0E+02	4.0E+01		2.0E+03	
79469	2-Nitropropane		C	9.0E-02	2.5E-02		9.0E-01	2.5E-01		9.0E+00	2.5E+00		1.8E+01	
924163	N-Nitroso-di-n-butylamine		C	1.5E-01	2.4E-02		1.5E+00	2.4E-01		1.5E+01	2.4E+00		1.2E+01	
103651	n-Propylbenzene	X	NC	1.4E+02	2.8E+01		1.4E+03	2.8E+02		1.4E+04	2.8E+03		3.2E+02	
88722	o-Nitrotoluene	X	NC	3.5E+01	6.2E+00		3.5E+02	6.2E+01		3.5E+03	6.2E+02		6.8E+04	
95476	o-Xylene	X	NC	7.0E+03	1.6E+03		7.0E+04	1.6E+04		7.0E+05	1.6E+05		3.3E+04	
106423	p-Xylene	X	NC	7.0E+03	1.6E+03		7.0E+04	1.6E+04		7.0E+05	1.6E+05		2.2E+04	
129000	Pyrene	X	NC	1.1E+02	1.3E+01		**	**		**	**		**	
135988	sec-Butylbenzene	X	NC	1.4E+02	2.6E+01		1.4E+03	2.6E+02		1.4E+04	2.6E+03		2.5E+02	
100425	Styrene		NC	1.0E+03	2.3E+02		1.0E+04	2.3E+03		1.0E+05	2.3E+04		8.9E+03	
98066	tert-Butylbenzene	X	NC	1.4E+02	2.6E+01		1.4E+03	2.6E+02		1.4E+04	2.6E+03		2.9E+02	
630206	1,1,1,2-Tetrachloroethane		C	3.3E+01	4.8E+00		3.3E+02	4.8E+01		3.3E+03	4.8E+02		3.3E+02	
79345	1,1,2,2-Tetrachloroethane		C	4.2E+00	6.1E-01		4.2E+01	6.1E+00		4.2E+02	6.1E+01		3.0E+02	
127184	Tetrachloroethylene		C	8.1E+01	1.2E+01		8.1E+02	1.2E+02		8.1E+03	1.2E+03		1.1E+02	
108883	Toluene		NC	4.0E+02	1.1E+02		4.0E+03	1.1E+03		4.0E+04	1.1E+04		1.5E+03	
156605	trans-1,2-Dichloroethylene	X	NC	7.0E+01	1.8E+01		7.0E+02	1.8E+02		7.0E+03	1.8E+03		1.8E+02	56 ug/l
76131	1,1,2-Trichloro-1,2,2-trifluoroethane		NC	3.0E+04	3.9E+03		3.0E+05	3.9E+04		3.0E+06	3.9E+05		1.5E+03	
120821	1,2,4-Trichlorobenzene		NC	2.0E+02	2.7E+01		2.0E+03	2.7E+02		2.0E+04	2.7E+03		3.4E+03	
79005	1,1,2-Trichloroethane		C	1.5E+01	2.8E+00		1.5E+02	2.8E+01		1.5E+03	2.8E+02		4.1E+02	
71556	1,1,1-Trichloroethane		NC	2.2E+03	4.0E+02		2.2E+04	4.0E+03		2.2E+05	4.0E+04		3.1E+03	
79016	Trichloroethylene ††	X	C	2.2E+00	4.1E-01		2.2E+01	4.1E+00		2.2E+02	4.1E+01		5.3E+00	92 ug/l
75694	Trichlorofluoromethane		NC	7.0E+02	1.2E+02		7.0E+03	1.2E+03		7.0E+04	1.2E+04		1.8E+02	
96184	1,2,3-Trichloropropane		NC	4.9E+00	8.1E-01		4.9E+01	8.1E+00		4.9E+02	8.1E+01		2.9E+02	
95636	1,2,4-Trimethylbenzene		NC	6.0E+00	1.2E+00		6.0E+01	1.2E+01		6.0E+02	1.2E+02		2.4E+01	

Table 2b: Question 4 Generic Screening Levels and Summary Sheet [1]

Risk = 1 x 10^{-5}

CAS No.	Chemical	Compounds with Provisional Toxicity Data Extrapolated From Oral Sources	Basis of Target Concentration C=cancer risk NC=noncancer risk	Target Indoor Air Concentration to Satisfy Both the Prescribed Risk Level and the Target Hazard Index [R=10^{-5}, HI=1] C_{target} (ug/m3)	(ppbv)	Measured or Reasonably Estimated Indoor Air Concentration [if available] (specify units)	Target Shallow Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.1 $C_{soil-gas}$ (ug/m3)	(ppbv)	Measured or Reasonably Estimated Shallow Soil Gas Concentration [if available] (specify units)	Target Deep Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.01 $C_{soil-gas}$ (ug/m3)	(ppbv)	Measured or Reasonably Estimated Deep Soil Gas Concentration [if available] (specify units)	Target Groundwater Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor = 0.001 and Partitioning Across the Water Table Obeys Henry's Law C_{gw} (ug/L)	Measured or Reasonably Estimated Groundwater Concentration [if available] (specify units)
83329	Acenaphthene	X	NC	2.1E+02	3.3E+01		2.1E+03	3.3E+02		2.1E+04	3.3E+03		**	
75070	Acetaldehyde		NC	9.0E+00	5.0E+00		9.0E+01	5.0E+01		9.0E+02	5.0E+02		2.8E+03	
67641	Acetone	X	NC	3.5E+02	1.5E+02		3.5E+03	1.5E+03		3.5E+04	1.5E+04		2.2E+05	
75058	Acetonitrile		NC	6.0E+01	3.6E+01		6.0E+02	3.6E+02		6.0E+03	3.6E+03		4.2E+04	
98862	Acetophenone	X	NC	3.5E+02	7.1E+01		3.5E+03	7.1E+02		3.5E+04	7.1E+03		8.0E+05	
107028	Acrolein		NC	2.0E-02	8.7E-03		2.0E-01	8.7E-02		2.0E+00	8.7E-01		4.0E+00	
107131	Acrylonitrile		C	3.6E-01	1.7E-01		3.6E+00	1.7E+00		3.6E+01	1.7E+01		8.5E+01	
309002	Aldrin		C	5.0E-03	3.3E-04		5.0E-02	3.3E-03		5.0E-01	3.3E-02		7.1E-01	
319846	alpha-HCH (alpha-BHC)		C	1.4E-02	1.1E-03		1.4E-01	1.1E-02		1.4E+00	1.1E-01		3.1E+01	
100527	Benzaldehyde	X	NC	3.5E+02	8.1E+01		3.5E+03	8.1E+02		3.5E+04	8.1E+03		3.6E+05	
71432	Benzene		C	3.1E+00	9.8E-01		3.1E+01	9.8E+00		3.1E+02	9.8E+01		1.4E+01	
205992	Benzo(b)fluoranthene	X	C	1.2E-01	1.1E-02		1.2E+00	1.1E-01		**	**		**	
100447	Benzylchloride	X	C	5.0E-01	9.7E-02		5.0E+00	9.7E-01		5.0E+01	9.7E+00		3.0E+01	
91587	beta-Chloronaphthalene	X	NC	2.8E+02	4.2E+01		2.8E+03	4.2E+02		2.8E+04	4.2E+03		**	
92524	Biphenyl	X	NC	1.8E+02	2.8E+01		1.8E+03	2.8E+02		1.8E+04	2.8E+03		**	
111444	Bis(2-chloroethyl)ether		C	7.4E-02	1.3E-02		7.4E-01	1.3E-01		7.4E+00	1.3E+00		1.0E+02	
108601	Bis(2-chloroisopropyl)ether		C	2.4E+00	3.5E-01		2.4E+01	3.5E+00		2.4E+02	3.5E+01		5.1E+02	
542881	Bis(chloromethyl)ether		C	3.9E-04	8.4E-05		3.9E-03	8.4E-04		3.9E-02	8.4E-03		4.5E-02	
75274	Bromodichloromethane	X	C	1.4E+00	2.1E-01		1.4E+01	2.1E+00		1.4E+02	2.1E+01		2.1E+01	
75252	Bromoform		C	2.2E+01	2.1E+00		2.2E+02	2.1E+01		2.2E+03	2.1E+02		8.3E-02	
106990	1,3-Butadiene		C	8.7E-02	3.9E-02		8.7E-01	3.9E-01		8.7E+00	3.9E+00		2.9E-02	
75150	Carbon disulfide		NC	7.0E+02	2.2E+02		7.0E+03	2.2E+03		7.0E+04	2.2E+04		5.6E+02	
56235	Carbon tetrachloride		C	1.6E+00	2.6E-01		1.6E+01	2.6E+00		1.6E+02	2.6E+01		5.0E+00 [†]	
57749	Chlordane		C	2.4E-01	1.5E-02		2.4E+00	1.5E-01		2.4E+01	1.5E+00		**	
126998	2-Chloro-1,3-butadiene (chloroprene)		NC	7.0E+00	1.9E+00		7.0E+01	1.9E+01		7.0E+02	1.9E+02		1.4E+01	
108907	Chlorobenzene		NC	6.0E+01	1.3E+01		6.0E+02	1.3E+02		6.0E+03	1.3E+03		3.9E+02	
109693	1-Chlorobutane	X	NC	1.4E+03	3.7E+02		1.4E+04	3.7E+03		1.4E+05	3.7E+04		2.0E+03	
124481	Chlorodibromomethane	X	C	1.0E+00	1.2E-01		1.0E+01	1.2E+00		1.0E+02	1.2E+01		3.2E+01	
75456	Chlorodifluoromethane		NC	5.0E+04	1.4E+04		5.0E+05	1.4E+05		**	**		**	
75003	Chloroethane (ethyl chloride)		NC	1.0E+04	3.8E+03		1.0E+05	3.8E+04		1.0E+06	3.8E+05		2.8E+04	
67663	Chloroform		C	1.1E+00	2.2E-01		1.1E+01	2.2E+00		1.1E+02	2.2E+01		8.0E+01 [†]	
95578	2-Chlorophenol	X	NC	1.8E+01	3.3E+00		1.8E+02	3.3E+01		1.8E+03	3.3E+02		1.1E+03	
75296	2-Chloropropane		NC	1.0E+02	3.2E+01		1.0E+03	3.2E+02		1.0E+04	3.2E+03		1.7E+02	
218019	Chrysene	X	C	1.2E+01	1.2E+00		**	**		**	**		**	
156592	cis-1,2-Dichloroethylene	X	NC	3.5E+01	8.8E+00		3.5E+02	8.8E+01		3.5E+03	8.8E+02		2.1E+02	
123739	Crotonaldehyde (2-butenal)	X	C	4.5E-02	1.6E-02		4.5E-01	1.6E-01		4.5E+00	1.6E+00		5.6E+01	
98828	Cumene		NC	4.0E+02	8.1E+01		4.0E+03	8.1E+02		4.0E+04	8.1E+03		8.4E+00	

Table 2a: Question 4 Generic Screening Levels and Summary Sheet [1]

Risk = 1 x 10^{-4}

CAS No.	Chemical	Compounds with Provisional Toxicity Data Extrapolated From Oral Sources	Basis of Target Concentration C=cancer risk NC=noncancer risk	Target Indoor Air Concentration to Satisfy Both the Prescribed Risk Level and the Target Hazard Index [$R=10^{-4}$, HI=1] C_{target} (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Indoor Air Concentration [if available] (specify units)	Target Shallow Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.1 $C_{soil-gas}$ (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Shallow Soil Gas Concentration [if available] (specify units)	Target Deep Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.01 $C_{soil-gas}$ (ug/m^3)	(ppbv)	Measured or Reasonably Estimated Deep Soil Gas Concentration [if available] (specify units)	Target Groundwater Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor = 0.001 and Partitioning Across the Water Table Obeys Henry's Law C_{gw} (ug/L)	Measured or Reasonably Estimated Groundwater Concentration [if available] (specify units)
108678	1,3,5-Trimethylbenzene		NC	6.0E+00	1.2E+00		6.0E+01	1.2E+01		6.0E+02	1.2E+02		2.5E+01	
108054	Vinyl acetate		NC	2.0E+02	5.7E+01		2.0E+03	5.7E+02		2.0E+04	5.7E+03		9.6E+03	
75014	Vinyl chloride (chloroethene)		C	2.8E+01	1.1E+01		2.8E+02	1.1E+02		2.8E+03	1.1E+03		2.5E+01	200 ug/l

[1] AF = 0.1 for Shallow Soil Gas Target Concentration
AF = 0.01 for Deep Soil Gas Target Concentration
AF = 0.001 for Groundwater Target Concentration

* Health-based target breathing concentration exceeds maximum possible chemical vapor concentration (pathway incomplete)

** Target soil gas concentration exceeds maximum possible vapor concentration (pathway incomplete)

† The target groundwater concentration is the MCL. (The MCL for chloroform is the MCL for total Trihalomethanes. The MCL listed for m-Xylene, o-Xylene, and p-Xylene is the MCL for total Xylenes.)

†† The target concentration for trichloroethylene is based on the upper bound cancer slope factor identified in EPA's draft risk assessment for trichloroethylene (US EPA, 2001). The slope factor is based on state-of-the-art methodology, however the TCE assessment is still undergoing review. As a result, the slope factor and the target concentration values for TCE may be revised further. (See Appendix D.)

APPENDIX B

JOHNSON-ETTINGER MODELS FOR COLLIS FACILITY

DATA ENTRY SHEET
Collis cis-1,2-DCE

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
156592	1.20E+03	cis-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	75	LS	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
LS			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	25	250

Used to calculate risk-based groundwater concentration.

RESULTS SHEET
Collis cis-1,2-DCE
Industrial

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	3.50E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	9.9E-02

MESSAGE SUMMARY BELOW:

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

END

DATA ENTRY SHEET
Collis TCE

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	9.20E+01	Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	75	LS	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, $\rho_b{}^V$ (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w{}^V$ (cm^3/cm^3)
LS			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	25	250

Used to calculate risk-based groundwater concentration.

RESULTS SHEET
Collis TCE

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.10E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.7E-07	NA

MESSAGE SUMMARY BELOW:

END

]

DATA ENTRY SHEET
Collis VC

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
75014	2.00E+02	Vinyl chloride (chloroethene)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	75	LS	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
LS			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	25	250

Used to calculate risk-based groundwater concentration.

RESULTS SHEET
Collis VC

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.76E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.1E-05	5.7E-02

MESSAGE SUMMARY BELOW:

END

]

APPENDIX C

WELLS WITHIN 1 MILE OF COLLIS FACILITY

Owner	Well Number	Total Depth	Type	Distance from Facility
COLLIS CORP.	7711	39	Monitoring	0
COLLIS CORP.	7713	17	Monitoring	0
COLLIS CORP.	7744	69	Monitoring	0
COLLIS CORP.	13978	1,633	Commercial	0
CLINTON COUNTRY CLUB	37155	872	Irrigation	< 0.5
CLINTON, CITY OF	5220	2,202	Municipal	< 0.5
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
WESTERN ICE CO.	30903	1,500	Commercial	< 0.75
SWIFT & COMPANY	853	1,253	Commercial	< 1
SETHNESS CORPORATION	17669	1,276	Commercial	< 1
CLINTON, CITY OF	17856	165	Municipal, Other	< 1
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]